DOCUMENT RESUME

ED 317 752 CE 054 490

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TITLE Use of Supply/Demand Data in Tennessee Secondary Vocational-Technical Education. Research in Tennessee Secondary Vocational-Technical Education.
INSTITUTION Tennessee Univ., Knoxville. Dept. of Technological and Adult Education.
SPONS AGENCY Tennessee State Dept. of Education, Nashville.
PUB DATE Sep 89
NOTE 66p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Articulation (Education); *Educational Planning; Educational Research; *Educational Supply; Education Work Relationship; Employment Projections; Entry Workers; *Information Utilization; *Labor Needs; *Labor Supply; Occupational Information; Program Improvement; School Business Relationship; Secondary Education; State Programs; Use Studies; *Vocational Education
IDENTIFIERS *Tennessee

ABSTRACT

A study was conducted to assess the potential use of available supply/demand data in planning for secondary vocational education programs in Tennessee. Literature was reviewed for ideas and an analysis was made of the data in the Tennessee Occupational Information System (TOIS). In addition, expert opinion was collected from a selected group of 12 vocational educators on ratios of supply/demand with respect to planning total secondary vocational education enrollment. The review of literature revealed a number of limitations to the use of work force data and also special precautions to observe when working with supply/demand data. An analysis of the TOIS database provided a graphic illustration of the secondary vocational programs with respect to the level of supply of graduates versus demand at the time data were collected. In addition, it was found that selected vocational educators had very definite ideas on what the ratio of supply to demand should be for selected programs of secondary vocational education. The study concluded that the specific use of supply/demand data for planning secondary vocational education is a difficult process. Part of the difficulty results from the lack of definitive data on entry-level occupations toward which most programs are directed. Closer working relations between data collectors and users can make the data more useful, and recommendations are made to increase such relationships and also to plan for under- or oversupply of various types of jobs. (Includes 29 references and a breakdown of supply/demand data for selected secondary vocational programs.) (Author/KC)

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RESEARCH IN TENNESSEE SECONDARY VOCATIONAL-TECHNICAL EDUCATION

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USE OF SUPPLY/DEMAND DATA IN TENNESSEE SECONDARY VOCATIONAL-TECHNICAL EDUCATION

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USE OF SUPPLY/DEMAND DATA IN TENNESSEE SECONDARY VOCATIONAL-TECHNICAL EDUCATION

September 1989

By

Walter A. Cameron and Sally Blowers

PREFACE

Several individuals have made contributions to initiating the research projects. Special recognition is hereby extended to the State Staff. Mr. Marvin Flatt, Assistant Commissioner for Vocational-Technical Education, Tennessee State Department of Education, Mr. Russell Smith, Administrative Assistant and Director of Field Services of the Tennessee Division of Vocational-Technical Education, Tennessee State Department of Education, and Mr. Jim Vinson, Director of Program Planning and Development. special recognition is also extended to Dr. Gerald Cheek, Professor and Chairperson for the Department of Technological and Adult Education, University of Tennessee - Knoxville for technical advice and departmental support for graduate assistant to help conduct the studies. The research projects would not have been possible without their support and assistance. Many local vocational administrators assisted by providing primary information or lists of names and addresses for securing additional information.

Seventeen potential research topics were gleaned from the Carl D. Perkins Vocational Education Act as being areas of interest for vocational education. The state staff identified six topics for first year priority. The research was conducted through the State Vocational Program Evaluation Project with various UTK professors invited to participate and graduate assistant provided by the department of Technological and Adult Education. The studies were conducted for the purpose of helping to secure information of interest and use by the State staff. Restrictions were placed upon each study with respect to the funding made available. The scope of this study and the other studies was confined to operate within the budgeting constraints. No graduate student used the data for a dissertation or thesis.

Secondary vocational-technical education is serving many secondary students in Tennessee. This research report should provide information to policy makers and planners to assist them in their efforts to continue to provide quality vocational-technical education for all secondary students in Tennessee.

Don E. McNelly
Director
State Secondary Vocational
Program Evaluation Project

The views, opinions, and/or findings expressed by the Authors are those of the Authors and should not be construed as an official Tennessee Department of Education or The University of Tennessee position, policy or recommendation. The research study was made possible with funds provided by the Division of Vocational-Technical Education, Tennessee State Department of Education, Graduate Assistants by the Department of Technological and Adult Education and personal professional time by the faculty members.

Table of Contents

	Page
Abstract	v
Introduction	1
Purpose and Objectives	2
Literature Review	3
General Workforce Trends	3
Employer Needs	4
Youth Participation in the Workforce	7
Development of Quantitative Data	9
The Use of Quantitative Data	12
Interpretation of Data	14
Program Planning in Vocational Education	15
Uses of Supply/Demand Data Cited in the Literature	17
Summary of Ideas from Literature	17
Methodology and Results	19
Introduction	19
Interpretation of TOIS Data	20
Problems with the Use of the TOIS Database	33
Expert Opinion on Supply	36
Findings, Conclusions and Recommedation	40
Findings	40
Conclusions	41
Recommedations	41

ABSTRACT

The purpose of this study was to assess the potential use of available supply/demand data in planning for secondary vocational education programs in Tennessee. The literature was reviewed for ideas and an analysis was made of the data in the Tennessee Occupational Information System (TOIS). In addition, expert opinion was collected from a selected group of vocational educators to obtain ideas on ratios of supply/demand with respect to planning total secondary vocational education enrollment.

The review of literature revealed a number of limitations to the use of workforce data and also special precautions to observe when working with supply/demand data. An analysis of the TOIS database provided a graphic illustration of the secondary vocational programs with respect to the level of supply of graduates versus demand at the time data were collected. In addition, it was found that selected vocational educators had very definite ideas on what the ratio of supply to demand should be for selected programs of secondary vocational education.

In conclusion, the specific use of supply/demand data for planning secondary vocational education is a difficult process. Part of this is due to the lack of definitive data on entry level occupations toward which most programs are directed. Closer working relations between data collectors and users can make the data more useful.

Recommendations for the Tennessee Department of Education, Division of Vocational-Technical Education to consider consisted of suggestions in four areas. These areas included: (1) more involvement in determining type of data collected, (2) role for assisting local educators in planning, (3) incentives for expanding programs in shortage areas and decreasing programs in oversupply areas, and (4) setting of secondary vocational education enrollment goals.

INTRODUCTION

The critical issue of workforce supply is a vital one for many segments of society. It is of special interest to those who have a role in the supply of workers. Vocational educators, one group involved in the preparation of workers, specifically entry level workers, are in need of an accurate concept of the supply/demand issue. Worker supply and occupational demand are complex interrelated concepts. Little specific information is available about how these two factors interact with each other. Nor is much known about the place these factors occupy within the context of the broader economic picture. Educational planners and various governmental agencies have shown increasing interest in obtaining objective data relevant to this issue. In the past, little objective data have been available, but increasing federal support and the efforts of the National Occupational Information Coordinating Committee and state level counterparts have resulted in the development of several statewide databases. The Tennessee Occupational Information System, compiled by the Occupational Employment Statistics Unit, Research and Statistics Division, Tennessee Department of Employment Security is the Tennessee database containing selected information relevant to the supply/demand issue. The focus of this study was to obtain an increased understanding of the worker supply/occupational demand issue as it relates specifically to the preparation of entry level workers through secondary vocational education programs in Tennessee.

In order to use increasingly limited fiscal and institutional resources effectively, it becomes vital to support vocational education programs which hold the promise of productive results. One of the criteria for examining the contribution of a given program is the relationship between labor market needs and the supply of qualified graduates of vocational programs.

Purpose and Objectives

The primary purpose of this study was to assess the potential use of available supply/demand data in planning realistic secondary vocational education programs for Tennessee. Specific objectives were:

1. Analyze the literature on the use and potential of supply/demand information with respect to its application to secondary vocational education.
2. Interpret available supply/demand data for Tennessee with regard to its present implications for secondary vocational education.
3. Project ways supply/demand data could be used effectively in the planning of secondary vocational education in Tennessee.

LITERATURE REVIEW

The literature review was divided into the following areas: general workforce trends, employer needs, youth participation in the workforce, development of quantitative data, use of quantitative data, interpretation of data, program planning in vocational education, and uses of supply/demand data. Literature for each of these areas was reviewed and a summary of ideas obtained from the literature is provided in this section.

General Workforce Trends

It has been well documented that America is shifting from a manufacturing based economy to a service based one. There will be fewer jobs in the traditional manufacturing sector. The response of the existing workforce in industry is not fully known. Will retraining allow these workers to remain in the same segment of the workforce, or will these workers exit to another segment? Will manufacturing require as few resources in the economy of the future as agriculture requires in today's? Will this require a reduction in the supply of workers for this segment of the economy? As trends are revealed and information becomes available, supply/demand issues may be better understood and the role of the younger worker clarified. The nature of the service economy and production in that economy remains poorly understood. It is known that these industries create economic value without creating a tangible product and that the value may be attached to the goods producing economy or independent of it (Hudson Institute, 1987). One projected benefit of the service economy is mitigation of business cycle downturns associated with the manufacturing industries. The impact of technology

upon the economy has been discussed widely. The most influence will be exerted by those technologies already in place (Hudson Institute, 1987). The impact of technological advances on educational requirements is unknown. The relative influence of mundane trends, such as automated service stations, is also unknown and impossible to predict (Barton, 1986).

The areas of greatest growth and employment opportunity in the next decade include: information processing and storage/computers; communications/printing and publishing; biotechnology/drugs and pharmaceutical products; and superconductivity/advanced materials, plastics. The broad occupational groups projected to have a faster than average growth rate include: technicians, service workers, professional workers, sales workers, and executives and managers (Hudson Institute, 1987; Kutscher, 1987)

The educational implications of current trends include increased emphasis upon cognitive skills and abilities and the need for the extension of educational preparation. Kutscher (1987) identified that the greater growth occupations will be those requiring at least one year of post secondary training. Within the next decade, "for the first time in history, a majority of all new jobs will require postsecondary education" (Hudson Institute, 1987, p. xviii).

Employer Needs

The individual employer has repeatedly indicated that today's high school/vocational graduates are lacking the skills and abilities required in the workplace (Bjorkquist, 1985; Semple, 1986; Stump, 1986; Braden, 1987-88). While inconsistencies and low response rates are

generally characteristic of employer surveys, the information generated is nonetheless valuable. This is true especially when these findings are considered as a body (Barton, 1986). Barton summarized findings from six national, one state and three city level employer surveys. Selected findings include:

1. Job character ranked highest as a factor in hiring practices.
2. It was more important for students to learn to think than it was for them to learn facts and figures.
3. Large corporations approved of increased emphasis on vocational skills and career education in public schools.
4. Vocational education was evaluated both positively and negatively by equal numbers of respondents.
5. Skill deficiency problems existed in the majority of job categories.
6. Students should be trained in occupations in demand in the labor market.
7. Students with vocational training were more employable than those without such training.
8. Vocational graduates would receive preference in hiring over nonvocational graduates.
9. Collaboration between vocational educators and employers could promote: better understanding of available jobs and career opportunities; improved job training; more realistic career and job expectations on the part of students; improve communication; and more efficient investment of public and private resources in the capital of the economy.
10. Workers at the lower clerical levels are chosen on the bases of positive attitudes toward work and language ability (only minimal typing ability is required); For computer related occupations, the preference is for youth with experience and/or education beyond the high school level; Banking industry hiring is based on basic literacy, figure aptitude and personal attributes; In the service sector, qualified, stable and motivated workers are sought.
11. Maintenance occupations call for a wide variety of technical complexity not suitable for public school training programs.

12. The top ten recruiting actions cited did not include seeking potential personnel from regional high schools.

13. Employers had greater problems with young entry-level employees than with other employees.

14. Young applicants were often rejected outright because of deficiencies in the application/interview process.

In conclusion, employers seek better background in reading, writing, computing, and listening skills; behaviors and attitudes more useful in the workplace; and specific occupational skills (Barton, 1986). Opinions on the appropriate balance between general skills and specific occupational skills in educational programs differed from survey to survey.

Young (1986) presented findings from one national, one state and one city level study. His findings indicated that employers desired competence in interpersonal skills; dependability; exhibition of interest; ability to stay with a task; acceptance of supervision; positive attitude; good communication skills; ability to problem-solve; and basic arithmetic ability.

Lea (1986) reported results from interviews with ten employers in the Silicon Valley. These respondents emphasized communication skills and the acquisition of flexible job skills applicable to more than one career.

In an article on technology and the workplace, Fedrau & Balfe (1986) describe trends related to manufacturing jobs. They conclude that employers in this sector seek workers who are motivated and can:

> get along with others and work as part of a team; communicate clearly; work with precision to maintain high-quality standards; acquire new skills with ease; improvise solutions to problems; assume more responsibility for decisions at a nonmanagement level; and readily accept change and uncertainty (p.295)

These authors also identified five factors to consider when planning educational programs for those who will enter the manufacturing/technological sector of the economy. These include: (1) an updated analyses of occupations (2) application of new training techniques that relate directly to the work setting (3) improvement of the collection and dissemination of information on emerging skill and training needs (4) adaptation of educational content to assure the development of "people" skills and (5) the marketing of existing training programs to employers with matching worker needs (p.297).

Youth Participation in the Workforce

For young people, participation in the workforce is influenced by a number of issues. Wolansky & McMahill (1986) identified factors that make it more difficult for young workers to obtain employment:

1. Birthrate shifts that create supply/demand imbalances for young workers
2. The influx of women into the workforce and their increasing placement in male-dominated occupations
3. The rise of education and training levels beyond the high school level
4. Employers' desire for experienced workers when capital outlay for equipment and facilities is high
5. Rising minimum wages with associated reduction in the number of beginning workers
6. A reduction in the number of entry level jobs in the manufacturing sector due to robots and plant relocations overseas
7. Lack of job experience
8. The greater productivity of experienced workers which is desired by firms to maintain a competitive edge
9. Inadequate job seeking and keeping skills

10. Job competition from legal and illegal immigrants

11. Employer caution in expanding their workforce due to the stop and go economy

12. Limited student financial aid

13. Decreased national attention to youth unemployment due to general improvement of overall employment figures at that level

14. Inadequate number of jobs for available young people in the current 40 hour work week structure (p. 66-7)

In addition, Barton (1986) identified issues related to the educational experiences of young people:

1. Experiences in American schools are characterized by an "extraordinary degree of passivity." (p. 136).

2. Students perceive their high school education as "crucially important for the future" (p. 137).

3. A pattern of behavior that cuts across economic lines is that of employment during the high school years (an average of 72% of 16-17 year olds were employed in 1980) (p. 139).

4. Looking at the school itself as a former of good work behaviors and attitudes is only part of the picture for "we should be looking as well into what students learn from the workplace before they graduate." This is especially true since there is evidence to indicate that working in high school is "associated with employment success after leaving school." (p. 140).

A final point worth noting is one advanced by Barton (1986, 1975). This point deals with the fact that high school graduation is not the point at which most youth join the adult labor market. There exists a somewhat separate youth labor market which, along with educational programs, "holds" youth until they begin to access "adult type" jobs at age 20-21. "My argument is that the coming of age in the American economy is about 21 and that a great majority of employers... either do not hire below that age as an explicit policy or as standard practice"

(p. 141). He stated that no studies since the one he reported in 1975 have dealt with the issue of hiring practices relative to age.

> "I would not claim that my proposition about the age of hiring is sufficiently established. But the case is solid enough to make it important ...to collect information on a more regular basis on the age factor in youth hiring" (p. 141).

If Barton's hypothesis holds true, employers are hiring workers who have had considerable additional experience in the workplace and such experience must be considered carefully in relationship to the contribution of secondary vocational education to employability. In summary:

> the relationship between what employers want from the schools and what the schools actually provide remains elusive. This is probably inevitable as long as we are looking for a clear answer that is applicable to employers (and the schools as well) in the aggregate. It is much more attainable in specific occupations in specific industries in specific communities where employers become involved with specific schools. (Choate, 1983, p. 142).

Development of Quantitative Data

Manpower research, including the identification of manpower data reflecting the nature of the labor market, is a

> very difficult task particularly in the context of educational planning and programming. The difficulty lies not only with the ability to manipulate the data and observe today's manpower situation, but also with the ability to predict the future outcomes of various skill demands. (Franchak, 1974, p. 3).

Future industry trends are not readily translated into educational needs (Barton, 1986). Specifically, matching educational supply with employment demand is difficult (McKinley, 1976). Goldstein (1980) identified two factors that make matching educational supply with demand especially difficult: training period length, which produces wide

fluctuations in supply related to demand at end of training, and institutional rigidity.

In attempting to understand the labor market, long standing efforts have been applied to the gathering and use of both subjective and objective data. While, historically, there has been poor availability and use of quantitative data (Drewes & Katz, 1975), there has been growing support over the last two decades for the identification and use of such data. Initially efforts were initiated at state and local levels where guides for information systems were developed (Paulson, 1981). Further support came via federal legislation in the mid 1960s and mid 1970s (Starr, 1982). The need for data was increased by the trend toward decentralization and by the fact that decisions were and are being made with special reference to particular geographic regions. The local employment picture must be understood in order to design intervention strategies that are effective. This means that decision-makers at all levels of government are requiring increasing amounts of occupational information to improve the quality of their decisions. (Paulson, 1981, p. 2).

The literature is severely restricted in its treatment of the issues and factors related to occupational information systems. Paulson (1981) has summarized five points:

1. No one piece of literature deals with the whole array of issues related to the establishment of an occupational information system.

2. There is a relative absence of discussions of the relationship between theories of the labor market or vocational choice and specific data needs.

3. Literature does not connect the occupational information needs and uses across the major user groups.

4. There is insufficient detail in the treatment of the use to which specific data elements will be put.

5. With few exceptions, there is limited discussion of the full range of actual data elements which should be included in an occupational information system (p. 65)

Two authors have identified the ideal components of an occupational information system. Drewes & Bice (1981) view occupational information system components broadly and would include information on energy, women in the workforce, productivity, population demographics, equal opportunity, civil rights, coordination and linkage, new and changing occupations, resource limitations, and the world economy. Paulson (1981) considered the following to be necessary based on review of the literature.

1. Occupational Demand - Definition includes current employment; current job openings; projected occupational demand including expansion, reduction and replacement demand; and employment by industry.

2. Occupational Supply - Definition includes current unemployment; occupational supply projections; vocational education enrollment; vocational education completion data; vocational education follow-up data; educational and training enrollment, completions, and follow-up not including vocational education; occupational transfers; labor force entrants/re-entrants including gross flow data; and labor market migration.

3. Supply/Demand - Includes analysis of supply demand indicators (specific indicators were not identified)

4. Occupational Characteristics - Definition includes job duties; occupational requirements; licensing, certification, registration information; hiring channels/entry methods including job search techniques; entry barriers including citizenship, veteran status, sex, race, height; career ladders including points of entry; earnings; benefits; hours worked; seasonality/regularity; job tenure; working conditions; nature of establishment; occupational organizations; and pertinent legislation.

5. Complementary Information - Includes current population; educational attainments of population; family income;

households receiving welfare; current labor force; current labor force unemployment; and education and training opportunities.

The Use of Quantitative Data

Support for the use of quantitative data comes from several sources. There is increasing evidence in federal legislative mandates of a national desire for better methods of using labor market information in planning and evaluating vocational education programs (Starr, 1982). Published labor market information influences policy requirements at federal and state levels (Franchak, 1983). Occupational training programs in particular must justify the need for skills taught (Iowa State Occupational Information Coordinating Committee [ISOICC], 1985; Hull, 1987). In addition, vocational educators are asked to verify the social and economic support for their product (Lawrence & Dane, 1974).

Labor market information can be used effectively as a point of departure for the decision making process (Franchak & Bruno, 1971; McNamara & Franchak, 1970). There is no single source of the "best" data (Starr, 1982). The accuracy of supply/demand data is dependent upon the predictability of the industries included in the database. The consistency in the proportion of specific occupations within those industries is also a factor. Projection data should be viewed in a relative rather than an absolute sense (Curtis, 1986).

The transferability of data from federal and state levels to the local level has been recognized as a problem (Drewes & Katz, 1975; Iowa SOICC; Choate, 1983). Data tied to areas as large as states and SMSAs is inaccurate for local purposes. In addition, unemployment data is

usually supplied by Employment Security Commissions which vary from state to state (Drewes & Katz, 1975). Another problem cited is that the data supplied are distrusted (Starr, 1982; Drewes & Katz, 1975; Lawrence & Dane, 1974). Further, when data are used there may be no relationship to the actual decisions made (Lawrence & Dane, 1974) or data may be used selectively to support conclusions already drawn (Starr, 1982; Drewes & Katz, 1975; Franchak, 1983). Data may also be included as a matter of form to meet federal or state requirements (Franchak, 1983).

While local planners are often encouraged to collect their own data (Drewes & Katz, 1975; Hull, 1987) there are often problems. Once collected, this data may be questioned, especially if coming from a rural area (Drewes & Katz, 1975). This is true even though it is still regarded by local administrators as a significant factor in decisions to add, terminate or modify programs (Franchak, 1983). Further, its accuracy may be difficult to evaluate since it is often available only for "in house" use (ISOICC, 1985). Local data may be used to counter or balance state level assessment (Drewes & Katz, 1975). When local surveys are used to supply labor market information, expense is a serious consideration (ISOICC, 1985). Results of private surveys must also be interpreted in light of the methods used to collect data and assumptions supporting the survey. For example, published tables from Puerto Rico's private survey yield numbers substantially different from labor department figures and figures from the Puerto Rico Occupational Information Coordinating Committee (Velez, 1987, pp. 96, 100-102, 110-112).

Interpretation of Data

The key to successful use is the appropriate interpretation of data. Goldstein (1980) asserted that this is the real issue rather than excusing non-use of data on the basis of the inaccuracy of some projections. An accurate interpretation is, however, dependent upon a thorough understanding of the limitations and scope of the data (Franchak & Bruno, 1971). Curtis (1986) illustrated this further in discussing the Pennsylvania occupational information system. In his consideration of data limitations, he discusses the tendency to view numbers as absolutes rather than as general descriptors. This is an interpretive problem. He concluded that "data do not provide the whole answer nor do they replace the need for further analysis and judgment" (p. 3).

Goldstein (1980) identified three specific weak spots in the available information: projections of the occupational composition, information on mobility among occupations, and patterns of withdrawal and return relative to individual occupations. These weak spots make interpretation vital. For example, an oversupply of workers may not mean that a program should be eliminated since outmigrations may produce a net demand.

Curtis (1986) gave additional examples of the need for interpretation. When published supply exceeds projected demand, consider that a one-to-one relationship between supply and demand has not been established as the optimum condition. Further, not every completer wants a job in the area trained, and many completers seek further training. In spite of analytical detail not all of supply and

demand can be documented and the relatedness of skills or transferability of specific job skills is a matter of judgment. When there is a high demand in occupations characterized by low skill levels and low pay, the absence of supply may not be the issue, rather the issue may be the lack of need for formal training programs.

Program Planning in Vocational Education

Within the field of vocational education, labor market data/occupational information is sought principally in order to improve the program planning process (Drewes & Katz, 1975; McKinlay, 1976; Braden & Paul, 1979; Drewes & Bice, 1981; Starr, 1982; Franchak, 1983; Hull, 1987). However, this information also applies to program administration and to client services, specifically to career selection (Drewes & Bice, 1981; Paulson, 1981).

Starr (1982) discussed long range planning in vocational education and asserted that this aspect of planning can be enhanced by the use of labor market information. Ten tasks inherent to the long range planning process are identified. These tasks include:

> describing the context and needs for vocational education; describing the mission of vocational education; describing program needs, goals, and objectives; describing the desired outcomes and benefits for vocational education; describing procedures for interagency coordination and collaboration; reassessing the context; reassessing the mission; reassessing program needs, goals and objectives; assessing the outcomes and benefits of vocational education; and assessing the coordination and collaboration procedures (p. xi).

This report illustrated the types of specific labor market information that can be utilized. For example, in examining the context and need for vocational education, the following sources might be used: annual

reports of regional or local planning commissions; census data; school enrollment trends; Labor Market Information Newsletter; Chamber of Commerce Reports; Affirmative Action Reports; Occupational Employment Statistics Program; and Employment Service 202 Reports. These sources would yield information about such factors as area unemployment trends, age groups served in the past and population trends.

Franchak (1983) reported a study conducted to identify factors that secondary and postsecondary vocational education administrators use as the basis for their decisions to add, terminate, or modify programs. Published labor market data were identified as one factor, but other input was valued more highly such as, advisory committee input, student enrollment figures and student interest, job placement rates, and input from faculty and administration (a major factor). Hull (1987), in discussing Georgia's position, indicated that decisions to start, stop and modify programs should be databased and related to the goals of the educational agency. Findings from Illinois, North Carolina, Ohio and Oregon indicated the criteria for starting new programs were student interest and labor market demand. The relative importance of each of these factors was not identified and criteria for data use varied from state to state.

Local planners exert the greatest amount of control over ongoing programs. The state is rarely involved in termination actions. At this level, placement and follow-up data is preferred over workforce projections. If workforce data are used, occupational growth and replacement data are cited as the most useful (Drewes & Katz, 1975). McKinlay (1976) suggested five factors for evaluating manpower data that

could be useful at the local level. These include: occupational detail of the data (whether dealing with broad occupational fields or detailed occupations); topics (how many aspects of each occupation should be described); precision (how exact information must be before action can be taken); currency (how frequently should data be updated to be useful); and localization (the degree to which the areas described by the data apply to the local area).

Uses of Supply/Demand Data Cited in the Literature

While there are numerous limitations of workforce data, the literature suggests that it can successfully test the economic efficiency of current and future program development (McNamara & Franchak, 1970). Supply/demand data can be used to reveal imbalances in the labor market and to construct growth profiles (ISOICC, 1985; Stanley, 1985; Connelly & Saxton, 1982). With local adjustments for significant influx or exodus of specific industries, the supply/demand data can measure the universe of available occupations for skilled and semi-skilled program completers (Curtis, 1986). National level data can be used by the local planner to compare national trends with local conditions (ISOICC, 1985). Finally, quantitative data holds the promise of going beyond opinion and prejudice in the decision-making process (Franchak, 1974).

Summary of Ideas from Literature

While not a complete list, the following topics were specifically mentioned in the literature as areas requiring further effort:

1. Develop clear and a priori models for selection and interpretation of data (Lawrence & Dane, 1974).

2. Establish procedures governing the updating of data (McNamara & Franchak, 1970).

3. Establish positions relative to the weight of student demand vs. workforce needs as decision making factors (Drewes & Katz, 1975; Hull 1987).

4. Develop individual experts in labor market information at the local level who can identify sources, compile and assess existing data and establish information sharing links (ISOICC, 1985).

5. Explicitly state assumptions supporting projections (Goldstein, 1980).

6. Package labor market information in formats meaningful to the user (Starr, 1982).

7. Provide more state assistance in local planning and state training to local planners in the use of data (Drewes & Katz, 1975).

METHODOLOGY & RESULTS

Introduction

Using the Tennessee Occupational Information System (TOIS) database, an initial title search was performed for each of the 47 programs listed in Appendix A. The resulting supply, demand and analysis data were then examined and a decision made to utilize the supply and demand data only. This was done because the analysis data is principally drawn from the records of Employment Security. This information has limited utility for the entry level worker who is joining the workforce for the first time. The decision was also made to concentrate upon information relevant to secondary school vocational programs in particular, since this was the primary focus of the study.

With this in mind, data for Aircraft Mechanics and Tool and Die making were not included because preparation is primarily at the post-secondary level. There were insufficient secondary school supply data for areas of Dental Assistant; Vocational Home Economics; and Ward Clerk. Since Drycleaning and Laundry Services and Shoe and Boot Repair are areas of occupational decline, they were eliminated. Data were inconclusive for Heavy Equipment Maintenance and Repair. Agribusiness, however, was included as Agricultural Products and Agricultural Services.

The supply/demand data generated from the initial search were combined to form a master table which was then condensed to form Table 1. The original master table with a breakdown of data for each program category is shown in Appendix B.

In order to make rational decisions regarding worker supply the appropriate ratio of supply to demand should be known. However, little is known about the ratio between workers and job openings. For example, should there be two workers available for each occupational opening? Should there be more than two? Do the needs for certain numbers of workers in some occupational groups differ from those in others? Since the literature did not describe the appropriate ratio between supply and demand in general, this information was sought from subject matter experts in the field. A group of 12 local vocational directors with expertise was contacted via a survey to determine their opinions regarding supply and demand for secondary programs in the state. Participants were asked to determine what the ratio of supply (total vocational education enrollment) should be with respect to demand.

Interpretation of TOIS Data

Data in Table 1 represent the programs of significance to vocational educators in Tennessee. The 1984 base employment figures were determined by combining base employment figures for each occupation listed under each program in Appendix B. The same procedure was followed to determine the average annual openings figures. The 1986 public secondary supply, community college/technical institute supply (CC/TI), area vocational technical school (AVTS) supply and job training partnership (JPTA) supply are given in separate columns and come directly from the TOIS figures. The total annual supply is a combination of the prior four sources. It should be noted that even though TOIS categorizes selected occupations under more than one CIP (Current Index to Programs) code, this was not done for this study.

Table 1
Demand and Supply Data for Selected Secondary Vocational Programs in Tennessee

CIP CODE	PROGRAM TITLE	1984 BASE EMPLOYMENT	AVERAGE ANNUAL OPENINGS	1986 SUPPLY: PUBLIC SECONDARY	1986 SUPPLY: CC/TI	1986 SUPPLY: AVTS	1986 SUPPLY: JTPA	TOTAL ANNUAL SUPPLY
07.0101	ACCOUNTING, BOOKKEEPING	39085	1995	865	65	38	25	993
01.0201	AGRICULTURAL MECHANICS	960	40	467		1		468
01.0301	AGRICULTURAL PRODUCTION	ND	ND	2429	1		19	2449
01.0401	AGRICULTURAL PRODUCTS	355	15	22				22
01.0501	AGRICULTURAL SERVICES	2625	180	28				28
47.0603	AUTOMOTIVE BODY REPAIR	3255	135	666		99	9	774
47.0604	AUTOMOTIVE MECHANICS	11790	495	1783		239	55	2077
46.0102	BRICK, BLOCK AND STONE	2125	65	132		32	1	165
10.0104	BROADCASTING	540	25	20			1	21
46.0201	CARPENTRY	14430	625	64		4	47	115
20.0201	CHILD CARE, GUIDANCE	2030	155	571	26	31	19	647
20.0102	CHILD DEVELOPMENT, CARE	2115	135	250				250
20.0301	CLOTHING, APPAREL, TEX[4]	39240	705	315	3	5	186	509
48.0203	COMMERCIAL ART	870	105	203		22		225
48.0204	COMMERCIAL PHOTOGRAPHY	2705	130	111		14		115
46.9999	CONSTRUCTION TRADES	1140	20	1491	17	20	248	1768
47.0202	COOLING AND REFRIGERATION	90	5	10		42	2	54
12.0403	COSMETOLOGY	5905	275	1039		147	6	1192
11.0301	DATA PROCESSING	6205	25	44	69		74	187
47.0605	DIESEL ENGINE MECHANIC	5835	240	44	8	53	4	109
48.0101	DRAFTING, GENERAL	4755	190	1165		203		1368
47.0101	ELECTRICAL AND ELECTRONIC	11970	575	511	69	223	22	825
46.0301	ELECTRICAL & POWER TRANSMISSION INSTALL	4220	120	345		47	4	396
15.0302	ELECTRICAL TECHNOLOGY	4805	110	14	66		31	111
46.0302	ELECTRICIAN	11775	440	39	23	27	24	113
07.0301	ELECTRONIC DATA PROCESSING	ND	ND	281	327	150	58	816
46.1111	FOOD OCCUPATIONS	81980	6740	835	4	86	222	1147
08.0700	GENERAL MARKETING[5]	155740	11890	5610	24		2	5636
	GENERAL METALS[3]	20175	455	375	13	399	34	821
48.0201	GRAPHIC AND PRINTING COMMUNICATIONS, GENERAL	5620	240	484	52	25	15	576
47.0201	HEATING, AIR CONDITIONING & REFRIG	3115	110	316		156	34	506
01.0601	HORTICULTURE, GENERAL	5635	480	488			10	498
47.0105	INDUSTRIAL ELECTRONICS	4580	205	20	5	60		85
17.0503	MEDICAL ASSISTING	2210	215				4	4
46.0499	MISCELLANEOUS CONSTRUCTION	1395	60	1093			8	1101
17.0602	NURSING ASSISTING	22490	1965	2		42	169	213
	OFFICE OCCUPATIONS[1]	170050	8470	5619	393	286	509	6807
46.0501	PLUMBING, PIPEFITTING	7550	300	36		9		45
17.0605	PRACTICAL NURSING	14410	1110	40		400	110	550
09.0701	RADIO/TELEVISION GENERAL	ND	ND	107			1	108

Table 1 (Con't)

Demand and Supply Data for Selected Secondary Vocational Programs in Tennessee

CIP CODE	PROGRAM TITLE/RELATED OCCUPATIONS	1984 BASE EMPLOYMENT	AVERAGE ANNUAL OPENINGS	1986 SUPPLY: PUBLIC SECONDARY	1986 SUPPLY: CC/TI	1986 SUPPLY: AVTS	1986 SUPPLY: JTPA	TOTAL ANNUAL SUPPLY
47.0606	SMALL ENGINE REPAIR	420	25	175		26		201
46.2222	TAILORING	510	55	22				22
48.0303	UPHOLSTERY	4620	190	39		23	8	70
48.0508	WELDING, BRAZING & SOLDERING	9955	305	439	6	385	58	888
48.0701	WOODWORKING, GENERAL	14270	645	320		22	77	419

[1] INCLUDES:
- 07.9999 BUSINESS & OFFICE
- 07.0401 OFFICE SUPERVISION & RELATED
- 07.0601 SECRETARIAL & RELATED
- 07.0606 TYPING, GEN OFFICE
- 07.0705 GEN OFFICE CLERK
- 07.0302 BUSINESS COMPUTER & CONSOLE OPERATING
- 07.0399 BUSINESS DATA PROCESSING
- 07.0305 BUSINESS DATA PROGRAMMING

[2] INCLUDES:
- 20.0401 FOOD PRODUCTION, MANAGEMENT
- 20.0403 CHEF/COOK
- 20.0406 FOOD SERVICE

[3] INCLUDES:
- 48.0503 MACHINE TOOL OP/MACHINE SHOP TECH
- 48.0501 PRECISION METAL WORK
- 48.0506 SHEET METAL
- 48.0504 METAL FABRICATION

[4] INCLUDES:
- 20.0103 CLOTHING & TEXTILES

[5] INCLUDES:
- 08.0799 GENERAL CO-OP

Any given occupation was only used once. This was done to avoid inflating the job market figures. In some cases the placement of an occupation under a certain program was arbitrary. Only those occupations which might be filled by an entry level secondary graduate were included.

According to An Introduction to Using the Tennessee Occupational Information System: A Reference for Planning, which was compiled by the Occupational Employment Statistics Unit of the Tennessee Department of Employment Security to accompany the TOIS database, determination of the supply/demand ratio provides useful information. The supply/demand ratio is the ratio of occupational openings to worker supply. The ratio indicates a shortage if under .50, a balance if between .50 and 1.50 and a surplus if over 1.50 (p.28). Supply/demand ratios were calculated for the forty-five program titles (with 182 related occupations) for which supply figures and openings figures were available. Ratios were calculated using total supply figures which includes post-secondary completers. They are reported to two decimal places with rounding used. This was done assuming that the secondary graduate competes within the context of the total job market. Ratios could not be calculated for Agricultural Production; Medical Assisting; General Radio/Television; and Electronic Data Processing (N=4, 8% of programs). This was because one or more categories of necessary data were unavailable in TOIS. The calculated ratios revealed a labor shortage for 13 or 28% of the programs/related occupations. However, of these programs associated with shortage, five (38%) had ratios of .4 to .49 which approaches balance. A ratio this close to balance is difficult to clearly

interpret as a realistic shortage. Ten programs (22%) were in balance with ratios of .5 - 1.47 and the remaining 42% indicated a surplus of labor supply. The range for all calculated ratios was .01 - 88.4.

The programs indicating a labor shortage (see Table 2) included: Agricultural Services; Carpentry; Tailoring; Medical Assisting; Industrial Electronics; Diesel Engine Mechanics; Electricians; Food Occupations; General Marketing; Plumbing, Pipefitting; Practical Nursing; Nursing Assisting; and Upholstery. Interpreting a shortage of agricultural services is especially difficult since it is a combined category for "all other" agriculture, forestry and fishery occupations. It is more than likely that occupations in these areas demand post-secondary education for entry level positions. Further, as documented in the literature, the shift to a service society may further reduce the demand for workers within the agricultural occupational group. Three of the shortage programs, Carpentry, Electricians and Plumbing/Pipefitting are composed of occupational groups that have special entrance requirements. These requirements may limit entry. In the event that additional support data indicate the need for expansion of these programs, this factor must be taken into consideration. One other group, Practical Nursing, also has special entrance requirements (licensure). Thus, even though a secondary graduate is prepared in this area, entrance into the occupation is dictated by a factor which may be beyond the control of the educational institution. Two program/occupation groups are composed of those who primarily enter the occupation through on-the-job training. These include Nursing Assisting and Food Occupations. For Food Occupations the greatest demand is for:

Table 2

Tennessee Programs/Related Occupations With A Labor Shortage Ratio

CIP Code	Program/Related Occupation	Supply/Demand
01.0501	Agriculture Services	.15
	*All Other Agric., Forest, Fish Pest Controllers And Assist	
46.0201	Carpentry	.18
	*Carpenters	
	Brattice Builders	
	Ceiling Tile Installers	
	Helpers, Carpenters	
47.0605	Diesel Engine Mechanic	.45
	Bus, Truck, Diesel Eng. Mechanic	
46.0302	Electrician	.26
	*Electricians	
	Helper, Electricians	
46.1111	Food Occupations	.17
	Dietetic Technicians	
	All Other Service Supervisors	
	All Other Food Service Workers	
	*Food Preparation Workers	
	Comb. Food Preparation, Service	
	Food Batchmakers	
	All Other Precision Food Top Wkrs	
	Cooking Machine Operator, Food	
	Roasting, Drying Oper., Food	
	Crushing & Mixing Machine Oper	
	Cooks, Restaurant	
	Cooks, Institution or Cafeteria	
	Cooks, Fast Food & Short	
08.0700	General Marketing	.47
	Merchandise Displayers	
	Sales Agents, Business Services	
	All Other Service Sales Occupations	
	*Salespersons, Retail	
	Salespersons, Parts	
	Counter & Rental Clerks	
	Stock Clerks, Sales Floor	
	Cashiers	
	Vendors, Solicitors, Door-to-Door	
	Demonstrators, Promoters	

Table 2 (Cont'd)

Tennessee Programs/Related Occupations With A Labor Shortage Ratio

CIP Code	Program/Related Occupation	Supply/Demand
	All Other Sales & Related Occs.	
	Customer Service Reps, Utilities	
	Marking Clerks	
	Guides	
	Drivers/Sales Workers	
47.0105	Industrial Electronics	.41
	Coin & Vending Machine Service	
	Central Office & PBX Installers	
	Frame Wirers, Central Office	
	Electronics Repairers, Comm.	
	*Telephone Station Installers & Repair	
	Coil Winders, Tapers, Finishers	
17.0503	Medical Assisting	.02
	Medical Assistants	
17.0602	Nursing Assisting	.11
	Nursing Aides & Orderlies	
46.0501	Plumbing, Pipefitting	.15
	*Plumber, Pipefitter, Steamfitter	
	Pipelayers	
	Septic Tank, Sewer Servicer	
17.0605	Practical Nursing	.49
	Licensed Practical Nurses	
46.2222	Tailoring	.40
	Custom Tailors & Sewers	
48.0303	Upholstery	.37
	*Upholsterers	
	Sewing Machine Oper., Non-Gar	
	All Other Assemblers, Fabric	
	All Other Hand Workers	

*Indicates occupation requiring the greatest number of workers

Fast Food and Short Order Cooks; Food Preparation Workers and Combination Food Preparation and Service workers.

While many employers in the health care field prefer to do their own on-the-job training for nursing assistants, this may become too costly in the near future. An increased need for vocational programs in this area may result. Medical Assistants, depending on their job content, may be trained on the job or in a vocational program. It is difficult to use TOIS figures to evaluate supply/demand for this group.

General Marketing, which contains primarily service occupations, represents an area of significant growth. Expansion of programs in this area may be needed. The Upholstery ratio of .37 may indicate a need for expanded programs, but this must be examined in light of the recent closing of garment manufacturing plants. The relationship between workers who operate garment construction machines and those who operate fabric assembling machines in the upholstery industry is unknown. It may be that workers in the garment industry possess transferable skills for the upholstery occupations. If so, the supply figures for upholstery would change and the ratio would alter. The final program, Sheet Metal, has a ratio that might support selected expansion of a General Metals program.

One difficulty with assuming that these ratios support program expansion however is that the appropriate ratio between supply and demand in general remains unknown. Thus, it is not clear that any of the programs identified with areas of labor shortage are unable to meet the labor need.

All of the programs indicating a labor surplus (see Table 3) had ratios well above the minimum surplus figure of 1.5 (range 1.82 -

Table 3

Tennessee Programs/Related Occupations With A Labor Surplus

CIP Code	Program/Related Occupation	Ratio
01.0101	Agricultural Mechanics	11.70
47.0603	Automotive Body Repair	5.73
47.0604	Automotive Mechanics	4.19
46.0102	Brick, Block & Stone	2.54
20.201	Child Care, Guidance	4.17
20.0102	Child Development, Care	1.85
46.0203	Commercial Art	2.14
46.9999	Construction Trades	88.40
47.0202	Cooling & Refrigeration	10.80
12.0403	Cosmetology	4.33
11.0301	Data Processing	7.48
48.0101	Drafting, General	7.20
46.0301	Electrical & Power Transmission Install	3.30
08.0700	General Metals	1.80
48.0201	Graphic & Printing Communications, General	2.40
47.0201	Heating, Air Conditioning & Refrig	4.60
46.0499	Miscellaneous Construction	18.35
47.0606	Small Engine Repair	8.04
48.0508	Welding, Brazing & soldering	2.91

88.40). For those programs with an extremely high surplus, the only conclusion that can be drawn from the data, is that there is wide variability.

Those programs with a labor balance (see Table 4) included: Agricultural Products; General Horticulture; General Woodworking; Commercial Photography; Broadcasting; Electrical & Electronic; Electrical Technology; Office Occupations; Accounting, Bookkeeping; and Clothing, Apparel, Textiles. All ratios fell within the .5 - 1.5 limits (range .5 - 1.47). Given the wide variability of other ratios, this relatively narrow range may not be indicative of a realistic labor balance. This may be especially true for Office Occupations; Broadcasting, Electrical Technology and Food Occupations since technicians and service workers are among the projected fastest growing occupational groups in the nation (see literature review). In addition, the Accounting, Bookkeeping ratio of .50 lies at the lower end of balance and approaches shortage. The technology related to this field which may alter the performance and skills associated with this occupational group may push the ratio further into balance, if fewer workers are required. Or, an increased demand may occur related to a larger number of small businesses, which would push the ratio into shortage. In this instance, related information which supplements the objective figures is needed.

Table 4

Tennessee Programs/Related Occupations With A Labor Balance

CIP Code	Program	Supply/Demand
07.0101	Accounting Bookkeeping	.50
01.0401	Agricultural Products	1.47
10.0104	Broadcasting	.84
20.0301	Clothing, Apparel, Textiles	.72
48.0204	Commercial Photography	.88
48.0204	Electrical & Electronic	1.43
15.0302	Electrical Technology	1.00
01.0601	Horticulture General	1.04
	Office Occupations	.80
48.0701	Woodworking, General	.65

The percentage of workers supplied by secondary vocational education programs is summarized in Table 5. This gives a sketch of the labor market segment most closely associated with the secondary supply.

In considering the pattern of secondary supply as a whole, these vocational programs are polarized in their supply of workers; they seem to supply either a majority of the workforce for a given occupational group or a minority. Of the 44 programs with secondary supply data available, 61% receive more than three-fourths of the workforce from Secondary programs. On the other hand, 30% of the occupational groups considered receive less than one-half of their labor supply from secondary programs. Approximately nine percent of the programs

Table 5

Percent Of Total Worker Supply Provided By Public Secondary Programs in Tennessee

CIP Code	Program Title	Percent
07.0101	Accounting, Bookkeeping	87.1
01.0101	Agricultural Mechanics	99.7
01.0301	Agricultural Production	99.0
01.0401	Agricultural Products	100.0
01.0501	Agricultural Services	100.0
47.0603	Automotive Body Repair	81.5
47.0604	Automotive Mechanics	84.4
46.0102	Brick, Block & Stone	80.0
10.0104	Broadcasting	95.2
46.0201	Carpentry	55.6
20.0102	Child Development, Care	100.0
20.0201	Child Care, Guidance	88.2
20.0301	Clothing, Apparel, Tex	51.5
48.0203	Commercial Art	90.2
48.0204	Commercial Photography	46.5
46.9999	Construction Trades	84.3
47.0202	Cooling & Refrigeration	18.5
12.0403	Cosmetology	87.1
11.0301	Data Processing	23.5
47.0605	Diesel Engine Mechanic	40.3
46.0101	Drafting, General	34.5
47.0101	Electrical & Electronics	81.7

Table 5 (Con't)

Percent Of Total Worker Supply Provided By Public Secondary Programs in Tennessee

CIP Code	Program Title	Percent
46.0301	Electrical & Power Trans. Install	87.0
15.0302	Electrical Technology	12.6
46.0302	Electrician	34.5
07.0301	Electronic Data Processing	34.4
46.1111	Food Occupations	100.0
08.0700	General Marketing	99.5
08.0799	General Co-op	
48.0201	Graphic & Printing Commun., Gen	84.0
47.0201	Heating, A/C & Refrigeration	62.4
47.0105	Industrial Electronics	23.5
	Office Occupations	76.0
46.0499	Miscellaneous Construction	99.2
46.0501	Plumbing, Pipefitting	80.0
17.0605	Practical Nursing	7.2
09.0701	Radio/Television, General	99.0
47.0606	Small Engine Repair	87.0
46.2222	Tailoring	100.0
48.0303	Upholstery	55.7
48.0508	Welding, Brazing & Soldering	49.4
48.0701	Woodworking, General	76.3

considered balanced their labor force between secondary vocational education supply and supply from other areas.

There were 13 programs that have a supply/demand ratio indicating a surplus labor supply where between 80% and 100% of the workers are supplied from the secondary level (Table 5). Does the fact that the majority of workers come from secondary programs into occupations with a labor surplus mean that the competition for jobs has increased? Does it mean that the number of workers supplied compared to the number of positions available in this group of occupations is a 3:1 or 4:1 ratio? Answers to these questions would assist in an understanding of the additional factors that affect this particular group of workers.

Problems with the Use of the TOIS Database

As noted in the preceding section, objective data is only one factor to consider when making decisions about vocational programs. In determining the usefulness of the objective data, the limitations of the database must be considered. Several limitations were encountered as the data for this study were generated and analyzed. Several illustrative problems will be briefly discussed.

The accuracy of the database is dependent upon the accurate representation of private sector industries and occupational groups. This is of course dependent upon the willingness of these groups to respond with reasonably accurate information. There is some indication that there are limitations in this area for the TOIS database due to the limited response rate from the private sector. In addition, in reporting data it is entirely possible that, due to the varying interpretations of the data categories, workers that are part of the competitive market for a given occupation are not included in that

occupation's statistics.

The currency of the data is an additional factor to be considered. For example, the supply data comes from 1986 figures. The demand data are drawn from a 1984 survey and the projection data is calculated for the year 1995. Therefore, the data do not reflect current major changes in labor supply and demand such as occur with the closing or opening of a major employing firm in a region. This impact upon supply/demand figures is obviously significant, but will not be reflected in the database until well after the event.

The database includes occupations listed by CIP, OES, DOT and Cluster Codes. Thus there is a good deal of overlap and duplication of figures. This is especially problematical to the novice user who may not recognize this overlap. In addition, the relationship between the different classifications is unclear which makes any potential separation of data difficult. It is especially difficult to obtain accurate information when occupations are grouped together under a catchall heading. For example, it would be useful--since there are manufacturers in the state of Tennessee who utilize plastic molds in some part of the production process--to have occupational data on occupations related to plastics. The information concerning plastics manufacturing is, however, grouped with Precision Metal Work and cannot be examined with any degree of reliability. An additional consideration illustrated by the plastics/metal combination is that combined occupational groups may have little relationship to one another in the real world. This ambiguity does not enhance the decision making of program planners.

An additional problem is that entry level occupations are difficult to classify as the 1977 issue of the Dictionary of Occupational Titles notes. This makes it difficult to accurately obtain information that relates specifically to this level of occupations which is one of the critical concerns to secondary vocational education program planners. Retail sales is a primary example. All the employment figures indicate that this is an area of strong growth and need in Tennessee. However, program planners are at a loss to identify program characteristics based on the grouped entry level data that is available in TOIS.

The generic nature of the supply data makes it impossible to obtain information regarding age, race, geographic representation and other socioeconomic factors significant to the supply/demand issue. Thus it is difficult to predict whether a secondary program should be tailored to a retraining effort or to the preparation of youth.

The currency of terms used in the database is also an issue. Key punch operators is one title that is not current with terminology in business and industry. This makes it impossible to determine whether supply/demand figures related to this occupation apply to the current labor market in the area of data entry and related computer occupations.

A final point to be made is that when examining state wide data, round numbers, in terms of fives, tens and hundreds provides sufficient accuracy. This may often be insufficient for the local planner. If the actual number of employees needed is fifteen and the demand data has been reported in terms of ten, this fifty percent difference could be highly significant to the local planner with limited resources.

Expert Opinion on Supply

Information on supply/demand was solicited from 12 vocational educators in Tennessee. These individuals were selected as being knowledgeable in vocational education and labor market needs. They were asked to indicate what the ratio of supply (total vocational enrollment) for 28 selected programs should be to meet job demands. Further, they were instructed that supply should account for preparation for postsecondary articulation and dropouts, as well as graduates for job entry.

After the initial ratio responses were collected by mail survey, the information from seven respondents was averaged for each of the 28 programs. The response summary containing the average ratios and their ranges was mailed to the group of seven educators who were given the opportunity to make changes to their first ratios if they wished. The results of the average ratios from this second response were used to prepare the final report. Terminology used for the survey and in reporting results differ from that used in TOIS (which appears in all previous tables). The survey terminology in Table 6 reflects the current terminology of vocational education programs in Tennessee.

In order to look at the possible use of the ratios, the data in Table 6 were compiled. Where available the annual demand for graduates in each of the programs was listed along with the 1986 supply data (numbers of actual completers of each program). For example, the annual demand for graduates of agricultural mechanics was 40, the available supply of graduates in 1985 was 468. When the suggested ratio of 3 is applied (3 x 40), the projected total enrollment in agricultural mechanics should be 120. Currently, there is an oversupply of graduates

Table 6

Expert Opinion on What Ratio of Supply to Demand Should Be With Respect to Total Secondary Vocational Enrollment in Tennessee

		Supply with Respect to Demand (Average ratio)	Annual Demand	Projected Total Enrollment Needs	Actual Supply
1.	Agri-business	3.1	195	605	50
2.	Agricultural Mechanics	3.0	40	120	467
3.	Air-cooled Engine Repair	3.4	25	85	201
4.	Appliance Repair	3.9	N/D		N/D
5.	Automotive Body Repair	4.3	135	580	666
6.	Automotive Mechanics	4.9	495	2,426	1,783
7.	Cabinetmaking & Millwork	3.9	645	2,516	320
8.	Carpentry	4.4	625	2,750	64
9.	Child Care	4.6	155	713	571
10.	Commercial Foods	4.1	6,740	25,584	835
11.	Cosmetology	4.1	275	1,128	1,039
12.	Diesel Mechanics	4.0	240	960	44
13.	Drafting	4.0	190	760	165
14.	Electronics	5.4	575	3,105	511
15.	Graphic Arts	4.0	240	960	484
16.	Health Occupations	6.0	1,965	11,790	N/D
17.	Heating, Air Cond. & Refrigeration	4.6	110	560	316
18.	Machine Shop	4.3	455	1,957	375
19.	Marketing	5.0	11,890	59,450	5,610

in this program (468 graduates for 40 possible jobs).

A look at the supply/demand figures reveals that nine programs (agricultural mechanics, air-cooled engine repair, auto body repair, auto mechanics, child care, cosmetology, graphic arts, masonry, and welding) are graduating larger numbers than needed to meet demand. For two programs no data were available and two programs (horticulture and broadcasting) had a balance between supply and demand. There were a total of 15 programs (agri-business, cabinetmaking, carpentry, commercial foods, diesel mechanics, drafting, electronics, heating, A/C & refrigeration, machine shop, marketing, office occupations, plumbing, electricity, sheet metal, and upholstery) in which the demand was greater than the supply.

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Findings

The major findings for this study were:

1. A review of the literature revealed there are a number of limitations to the use of workforce data but that it can:

   a. Be used to test the economic efficiency of program development.
   b. Be used to reveal imbalances in the labor market and to construct growth profiles.
   c. Measure the universe of available occupations if local adjustments for significant influx or exodus of specific industries are made.
   d. Take the decision-making process beyond opinion and prejudice.

2. The review of literature also cited several special precautions to observe when working with supply/demand data. These are:

   a. Develop clear models for selection and interpretation of data.
   b. Users should work closely with data supplier in reviewing procedures for updating data so user can be assured of getting data that will be useful.
   c. Establish positions with respect to the weight of student desires versus workforce demands as decision-making factors.
   d. Provide state assistance in helping local educators in using supply/demand data in planning at the local level.

3. Analysis of the TOIS supply/demand data for 45 secondary vocational programs revealed:

   a. Twenty-eight percent (13 programs) did not supply sufficient graduates for the demand in Tennessee.
   b. Twenty-two percent (10 programs) provided a supply of graduates which was considered to be in balance with demand.
   c. Forty-two percent (18 programs) provided a supply of graduates which was greater than needed for the current labor demand.

4. When asked what the ratio of supply (total secondary vocational education) to demand for 28 secondary vocational programs, average ratios ranging from 3 to 6 were identified by vocational experts. Ratio ranges as follows were identified:

a. In the ratio range of 3.0 to 3.9 were the programs of: agri-business, agricultural mechanics, air-cooled engine repair, appliance repair, cabinetmaking & millwork, ornamental horticulture, plumbing, radio & TV broadcasting, sheet metal, and upholstery.
b. In the ratio range of 4.0 to 4.9 were the programs of: automotive body repair, automotive mechanics, carpentry, child care, commercial foods, cosmetology, diesel mechanics, drafting, graphic arts, heating, air conditioning and refrigeration, machine shop, masonry, residential and industrial electricity, and welding.
c. In the ratio range of 5.0 to 6.0 were the programs of: electronics, health occupations, marketing, and office occupations.

Conclusions

The conclusions drawn from the findings of the study include:

1. The literature provides some general guidelines on the collection and use of supply/demand data, but provides no information on its application with respect to secondary vocational education.

2. The current supply/demand data consisting of supply data from 1986 and demand data collected in 1984 provides a graphic description of the labor market at a point in time, but probably does not reflect the current situation.

3. Expert or judgmental opinion for setting state-wide planning goals for supply in secondary vocational education is feasible.

Recommendations

The following recommendations are made:

1. The staff of the Division of Vocational-Technical Education should work closely with the Research and Statistics Section of the Department of Employment Security to insure that specific data are collected on jobs related to all secondary vocational programs. In broad-level programs such as office occupations, marketing, and health occupations, the technique of relating labor data only to related CIP codes is not sufficient for planning purposes.

2. The staff of the Division of Vocational-Technical Education should assist local systems in using state supply/demand data in planning new programs. Assistance should be given in collecting local data to support proposed programs.

3. The Division of Vocational-Technical Education staff, using the latest labor information, should proceed to identify

program areas where supply shortages and over supply exist. Incentives, such as increased share of costs by the state, might be used to encourage local systems to develop programs when supply shortages exist. Limiting levels of support to the local system might be tried as a means to reduce programs for which there is an oversupply of graduates.

4. The Division of Vocational-Technical Education should consider developing a state-wide committee to determine ratios of supply/demand to serve as goals for determining total enrollments for all programs of secondary vocational education.

5. The Division of Vocational-Technical Education should consider establishing a decision-making model for allocating resources. This model should utilize available supply/demand data; local and state-wide student interest survey; local employment opportunity data and local job placement data for vocational graduates.

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Appendix A

Program Areas

Agribusiness
Agriculture Mechanics
Agriculture Production
Aircraft Mechanics
Automotive Body Repair
Automotive Mechanics
Brick, Block and Stone Masonry
Business and Office
Carpentry
Child Care and Guidance Management and Services
Clothing, Apparel and Textile Management
Commercial Art
Commercial Photography
Communication Electronics
Computer Electronics
Cosmetology
Dental Assistant
Diesel Engine Mechanics
Drafting
Drycleaning and Laundry Services
Electrician
Electrician and Electronics Equipment Repair
Electrical and Power Transmission Installation
Electromechanical Instrumentation and Maintenance
Food Production, Management and Services
Graphic and Printing Communications
Heating, Air Conditioning and Refrigeration Mechanic
Heavy Equipment Maintenance and Repair
Horticulture
Industrial Electronics
Industrial Machinery Maintenance and Repair
Machine Tool Operation/Machine Shop
Marketing
Miscellaneous Construction Trades
Plumbing, Pipefitting and Steamfitting
Practical Nursing
Precision Metal Work
Sheet Metal
Shoe and Boot Repair
Small Engine Repair
Tool and Die Making
Truck Driving
Upholstering
Vocational Home Economics
Ward Clerk
Welding, Brazing and Soldering
Woodworking

Appendix B

Breakdown of Demand and Supply Data for Selected Secondary Vocational Programs in Tennessee

CIP CODE	PROGRAM TITLE/RELATED OCCUPATIONS	1984 BASE EMPLOYMENT	AVERAGE ANNUAL OPENINGS	1986 SUPPLY: PUBLIC SECONDARY	1986 SUPPLY: CC/TI	1986 SUPPLY: AVTS	1986 SUPPLY: JTPA	TOTAL ANNUAL SUPPLY
07.0101	ACCOUNTING, BOOKKEEPING			865	65	38	25	993
	BOOKKEEPING & ACCOUNTING CLERKS	34595	1900					
	STATISTICAL CLERKS	645	20					
	PAYROLL & TIMEKEEPING CLERKS	3845	75					
01.0201	AGRICULTURAL MECHANICS			467		1		468
	FARM EQUIPMENT MECHANICS	960	40					
01.0301	AGRICULTURAL PRODUCTION			2429	1		19	2449
01.0401	AGRICULTURAL PRODUCTS			22				22
	GRADERS & SORTERS, AGRIC. PR		150	5				
	DAIRY PROCESS EQUIP. OPE	205	10					
01.0501	AGRICULTURAL SERVICES			28				28
	ALL OTHER AGRIC., FOREST, FIS	1350	90					
	PEST CONTROLLERS AND ASSIST	1275	90					
47.0603	AUTOMOTIVE BODY REPAIR			666		99	9	774
	AUTOMOTIVE BODY, RELATED REPAIR	2830	115					
	PAINTERS TRANSPORTATION EQUIP	425	20					
47.0604	AUTOMOTIVE MECHANICS			1783		239	55	2077
	AUTOMOTIVE MECHANICS	9620	400					
	TIRE REPAIRERS AND CHANGERS	2170	95					
46.0102	BRICK, BLOCK AND STONE			132		32	1	165
	BRICK MASONS	1735	55					
	STONE MASONS	140	5					
	HARD TILE SETTERS	250	5					
10.0104	BROADCASTING			20			1	21
	BROADCAST TECHNICIANS	540	25					
07.0302	BUSINESS COMPUTER AND CONSOLE OPERATING			175	139	2	118	434
	COMPUTER OPERATORS, EXCLUDING PERIPH.	4285	195					
	PERIPHERAL EDP EQUIP. OPERATORS	940	55					
07.0305	BUSINESS DATA PROGRAMMING			181			30	211
	COMPUTER PROGRAMMERS & AIDE	5430	515					
46.0201	CARPENTRY			64		4	47	115
	CARPENTERS	10615	535					
	BRATTICE BUILDERS	120	0					
	CEILING TILE INSTALLERS	390	20					
	HELPERS, CARPENTERS	3305	70					

CIP CODE	PROGRAM TITLE/RELATED OCCUPATIONS	1984 BASE EMPLOYMENT	AVERAGE ANNUAL OPENINGS	1986 SUPPLY: PUBLIC SECONDARY	1986 SUPPLY: CC/TI	1986 SUPPLY: AVTS	1986 SUPPLY: JTPA	TOTAL ANNUAL SUPPLY
20.0403	CHEF/COOK						24	24
	COOKS, RESTAURANT	6705	785					
	COOKS, INSTITUTION OR CAFETERIA	9875	665					
	COOKS, FAST FOOD & SHORT	12820	1150					
20.0201	CHILD CARE, GUIDANCE			571	26	31	19	647
	CHILD CARE WORKERS	2030	155					
20.0102	CHILD DEVELOPMENT, CARE			250				250
	TEACHER AIDES & EDUCATIONAL ASSIST.	1915	125					
	RECREATION WORKER	200	10					
20.0301	CLOTHING, APPAREL, TEX			181	3	5	162	351
(20.0103	CLOTHING AND TEXTILES)			134			24	158
	PRESSERS, HAND	700	25					
	ALL OTHER HAND WORKERS	595	35					
	SEWING MACHINE OPERATOR, GARMENT	37655	610					
	ALL OTHER PRECISION TEXTILE	290	35					
48.0203	COMMERCIAL ART			203		22		225
	ARTISTS AND RELATED WORKERS	870	105					
48.0204	COMMERCIAL PHOTOGRAPHY			111		14		125
	PHOTOGRAPHERS	1000	40					
	PHOTOGRAPHIC PROCESS WORKERS	775	40					
	PHOTOGRAPHIC PROCESSING MACH.	930	50					
46.9999	CONSTRUCTION TRADES			1491	17	20	240	1768
	HELPERS, ALL OTHER CONSTRUCTION	1140	20					
47.0202	COOLING AND REFRIGERATION			10		42	2	54
	HEATING EQUIP. SETTER/OPER.	90	5					
12.0403	COSMETOLOGY			1039		147	6	1192
	HAIRDRESSER COSMETOLOGY	5290	250					
	MANICURISTS	220	5					
	SHAMPOOERS	395	20					
11.0301	DATA PROCESSING			44	69		74	187
	DATA ENTRY KEYERS, EX. COMP	6205	25					
47.0605	DIESEL ENGINE MECHANIC			44	8	53	4	109
	BUS, TRUCK, DIESEL ENG. MECHANIC	5835	240					
48.0101	DRAFTING, GENERAL			1165		203		1368
	DRAFTERS	4755	190					

CIP CODE	PROGRAM TITLE/RELATED OCCUPATIONS	1984 BASE EMPLOYMENT	AVERAGE ANNUAL OPENINGS	1986 SUPPLY: PUBLIC SECONDARY	1986 SUPPLY: CC/TI	1986 SUPPLY: AVTS	1986 SUPPLY: JTPA	TOTAL ANNUAL SUPPLY
47.0101	ELECTRICAL AND ELECTRONIC			511	69	223	22	825
	HOME ENTERTAINMENT EQUIPMENT REPAIR	1070	55					
	RADIO MECHANICS	70	0					
	ELECTRICAL HOME APPLIANCE AND POWER	255	15					
	ELECTRIC MOTOR REPAIRERS	255	15					
	OFFICE MACHINE REGISTER SERVICE	610	30					
	ELECTROMECHANICAL EQUIPMENT ASSEMBLER	400	15					
	ELECTRICAL, ELECTRONIC ASSEMBLER	4245	140					
	ELECTRICAL AND ELECTRONIC TECH.	5065	305					
46.0301	ELECTRICAL & POWER TRANSMISSION INSTALL			345		47	4	396
	TELEPHONE & CABLE TV INSTALLERS	1480	20					
	ELECTRICAL POWER LINE INSTALLERS	2210	55					
	ELECTRIC METER INSTALLERS/RESIDENTIAL	410	45					
	HELPERS, ELECTRICIANS	120	0					
15.0302	ELECTRICAL TECHNOLOGY			14	66		31	111
	ELECTRICAL, ELECTRONIC ASSEMBLER	4805	110					
46.0302	ELECTRICIAN			39	23	27	24	113
	ELECTRICIANS	10660	425					
	HELPERS, ELECTRICIANS	1115	15					
07.0301	ELECTRONIC DATA PROCESSING			281	327	150	58	816
46.1111	FOOD OCCUPATIONS			159				159
	ALL OTHER FOOD SERVICE WORKERS	4715	315					
20.0401	FOOD PRODUCTION, MANAGEMENT			676	4	86		766
	DIETETIC TECHNICIANS	290	25					
	ALL OTHER SERVICE SUPERVISORS	1895	125					
20.0406	FOOD SERVICE						198	198
	FOOD PREPARATION WORKERS	22065	1820					
	COMB. FOOD PREPARATION, SER	21575	1795					
	FOOD BATCHMAKERS	390	10					
	AO PREC FOOD TOB WKR	695	25					
	COOKING MACHINE OPERATOR, FOOD	300	5					
	ROASTING, DRYING OPER., FOOD	220	5					
	CRUSHING & MIXING MACHINE OPER	435	15					
07.0705	GENERAL OFFICE CLERK							
	ADJUSTMENT CLERKS	2805	160					
	BROKERAGE CLERKS	545	20					
	INSURANCE EXAMINING CLERKS	85	0					
	INSURANCE CLAIMS CLERKS	1710	45					
	INSURANCE POLICY PROCESS CLERKS	2110	100					
	COURT CLERKS	1245	50					
	MUNICIPAL CLERKS	270	5					
	LICENSE CLERKS	120	5					
	ADVERTISING CLERKS	215	10					

CIP CODE	PROGRAM TITLE/RELATED OCCUPATIONS	1984 BASE EMPLOYMENT	AVERAGE ANNUAL OPENINGS	1986 SUPPLY: PUBLIC SECONDARY	1986 SUPPLY: CC/TI	1986 SUPPLY: AVTS	1986 SUPPLY: JTPA	TOTAL ANNUAL SUPPLY
07.0705	GENERAL OFFICE CLERK (Continued)							
	REAL ESTATE CLERKS	240	15					
	RECEPTIONISTS INFORMATION CLERKS	10620	625					
	CORRESPONDENCE CLERKS	250	20					
	FILE CLERKS	2940	70					
	ORDER CLERKS: MATERIALS, SE	4605	250					
	PROCUREMENT CLERKS	765	30					
	BILLING, COST AND RATE CLERKS	5405	270					
	GENERAL OFFICE CLERKS	37475	1780					
	INTERVIEWING CLERKS	1565	145					
08.0700	GENERAL MARKETING			4436			2	4438
(08.0799	GENERAL CO-OP)			1174	24			1198
	MERCHANDISE DISPLAYERS	400	40					
	SALES AGENTS, BUSINESS SERVICES	3000	280					
	ALL OTHER SERVICE SALES OCCUPATIONS	1510	165					
	SALESPERSONS, RETAIL	63545	5415					
	SALESPERSONS, PARTS	6240	250					
	COUNTER & RETAIL CLERKS	1755	185					
	STOCK CLERKS, SALES FLOOR	19080	1465					
	CASHIERS	42980	3130					
	VENDORS, SOLICITORS, DOOR-TO-DOOR	1480	105					
	DEMONSTRATORS, PROMOTERS	320	30					
	ALL OTHER SALES & RELATED OCCUPATIONS	5395	370					
	CUSTOMER SERVICE REPS, UTILITIES	1005	45					
	MARKING CLERKS	1600	115					
	GUIDES	380	30					
	DRIVERS/SALES WORKERS	7050	265					
48.0201	GRAPHIC AND PRINTING COMMUNICATION, GENERAL			484	52	25	15	576
	JOB PRINTERS	425	20					
	ALL OTHER PRECISION PRINTING	30	0					
	PRINTING PRESS MACHINE SETTER/OP	160	5					
	LETTERPRESS SETTER/OPERATOR	405	10					
	ALL OTHER PRINTING PRESS SETTERS	285	10					
	PHOTOENGRAVING & LITH. PHOT	585	40					
	SCREEN PRINTING MACHINE SETTER	580	10					
	TYPESETTING MACHINE OPERATOR	480	20					
	PRINTING PRESS MACHINE OPERATOR	2350	110					
	PHOTOENGRAVING & LITHOG. OPERATOR	125	10					
	ALL OTHER PRINTING SETTERS/OPERATORS	135	0					
	ENGRAVING AND PRINTING, HAND	60	5					
47.0201	HEATING, AIR CONDITIONING & REFRIG			316		156	34	506
	HEATING, A/C, REFRIG. MECHANICS	3115	110					
01.0601	HORTICULTURE, GEN			488			10	498
	NURSERY WORKERS	230	15					
	GARDENERS AND GROUNDSKEEPERS	5405	465					

CIP CODE	PROGRAM TITLE/RELATED OCCUPATIONS	1984 BASE EMPLOYMENT	AVERAGE ANNUAL OPENINGS	1986 SUPPLY: PUBLIC SECONDARY	1986 SUPPLY: CC/TI	1986 SUPPLY: AVTS	1986 SUPPLY: JTPA	TOTAL ANNUAL SUPPLY
47.0105	INDUSTRIAL ELECTRONICS			20	5	60		85
	COIN AND VENDING MACHINE SERVICE	740	40					
	CENTRAL OFFICE & PBX INSTALLERS	1185	65					
	FRAME WIRERS, CENTRAL OFFICE	145	5					
	ELECTRONICS REPAIRERS, COMM.	530	50					
	TELEPHONE STATION INSTALLERS & REPAIR	1255	5					
	COIL WINDERS, TAPERS, FINISHERS	725	40					
48.0503	MACHINE TOOL OP/MACHINE SHOP TECH			360	13	369	28	770
	SAWING MACHINE TOOL SETTER/OP	365	5					
	LATHE, TURNING MACH. SETTER/OP	1890	20					
	DRILLING BORING MACH. SETTER/OP	1240	25					
	MILLING, PLANING MACHINE SETTER/OP	630	10					
	GRINDING, BUFFING MACH. SETTER/OP	1480	35					
	MACHINE TOOL CUTTING OPER.	2955	45					
	PRESS, BRAKE MACH. SETTER/OP	1740	40					
	EXTRUDING MACH. SETTER/OP	180	5					
	ROLLING MACHINE SETTER/OP	290	5					
	FORGING MACHINE SETTER/OP	265	5					
	NUMERICAL CONTROL MACH. TOOL	1025	20					
	COMBINATION MACH. TOOL OPER.	975	40					
17.0503	MEDICAL ASSISTING						4	4
	MEDICAL ASSISTANTS	2210	215					
48.0504	METAL FABRICATION						1	1
	ALL OTHER PRECISION METAL WORKERS	525	10					
46.0499	MISCELLANEOUS CONSTRUCTION			1093			8	1101
	ALL OTHER CONSTRUCTION WORK	1395	60					
17.0602	NURSING ASSISTING			2		42	169	213
	NURSING AIDES AND ORDERLIES	22490	1965					
07.0401	OFFICE SUPERVISION AND RELATED			35			4	39
(07.9999	BUSINESS AND OFFICE)			308	106	564		978
(07.0399	BUSINESS DATA PROCESSING)			303	50			353
46.0501	PLUMBING, PIPEFITTING			36		9		45
	PLUMBER, PIPEFITTER, STEAMF	6260	255					
	PIPELAYERS	1225	45					
	SEPTIC TANK, SEWER SERVICER	65	0					
17.0605	PRACTICAL NURSING			40		400	110	550
	LICENSED PRACTICAL NURSES	14410	1110					
48.0501	PRECISION METAL WORK, G					8	1	9
	ALL OTHER METAL/PLASTIC SET	45	0					
	ALL OTHER METAL/PLASTIC OPE	120	0					
09.0701	RADIO/TELEVISION GENERAL			107			1	108

CIP CODE	PROGRAM TITLE/RELATED OCCUPATIONS	1984 BASE EMPLOYMENT	AVERAGE ANNUAL OPENINGS	1986 SUPPLY: PUBLIC SECONDARY	1986 SUPPLY: CC/TI	1986 SUPPLY: AVTS	1986 SUPPLY: JTPA	TOTAL ANNUAL SUPPLY
07.0601	SECRETARIAL AND RELATED			2084	6	220		2310
(07.0606	SECRETARIAL AND OFFICE ALL OTHER)				235		81	316
	FIRST LINE SUPERVISORS, CLERICAL	15075	880					
	INVESTIGATORS, CLERICAL	185	25					
	LEGAL SECRETARIES	2175	90					
	MEDICAL SECRETARIES	2555	170					
	ALL OTHER SECRETARIES	48745	2035					
	DUPLICATING MACHINE OPERATORS	160	5					
	MAIL MACHINE OPERATORS	685	45					
	ALL OTHER OFFICE MACHINE OPERATORS	800	25					
	SWITCHBOARD OPERATORS	4670	355					
48.0506	SHEET METAL			15		22	3	40
	SHEET METAL WORKERS	5605	160					
	STRUCTURAL METAL FABRICATOR	720	30					
	SHEET METAL DUCT INSTALLERS	125	0					
47.0606	SMALL ENGINE REPAIR			175		26		201
	SMALL ENGINE SPECIALISTS	420	25					
46.2222	TAILORING			22				22
	CUSTOM TAILORS AND SEWERS	510	55					
07.0701	TYPING, GENERAL OFFICE			3179	13	64	280	3536
	TYPISTS	8465	330					
	TYPISTS, WORD PROCESSING EQUIPMENT	2910	145					
48.0303	UPHOLSTERY			39		23	8	70
	UPHOLSTERERS	2505	100					
	SEWING MACHINE OPER., NON-GAR	1540	55					
	ALL OTHER ASSEMBLERS, FABRIC	205	10					
	ALL OTHER HAND WORKERS	370	25					
48.0508	WELDING, BRAZING & SOLDERING			439	6	385	58	888
	WELDING MACHINE SETTER/OPER	2535	80					
	WELDING MACHINE OPERATORS	1610	55					
	SOLDERING, BRAZING MACHINE SETTERS	210	10					
	SOLDERING, BRAZING MACHINE	200	5					
	WELDERS AND CUTTERS	4975	145					
	SOLDERERS AND BRAZERS	425	10					
48.0701	WOODWORKING, GENERAL			320		22	77	419
	CABINET MAKERS AND BENCH CARPENTERS	2115	125					
	FURNITURE FINISHERS	910	50					
	ALL OTHER PRECISION WOODWORKERS	335	5					
	SAWING MACHINE SETTER/OPERATOR	440	20					
	SAWING MACHINE OPERATOR/TEN	2160	100					
	WOODWORKING MACHINE SETTER	840	35					
	WOODWORKING MACHINE OPERATOR	1760	85					
	ALL OTHER ASSEMBLERS, FABRICATORS	3865	125					
	WOOD MACHINISTS	1815	100					
	PATTERN MARKERS, WOOD	30	0					